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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/722,841

Applicant(s)

BAUMBERGER, DANIEL P.

Examiner

Eric C. Wai

Art Unit

2195

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 November 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-61 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-61 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Claims 1-61 are presented for examination.

Claim Rejections - 35 USC § 101

2. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

3. Claims 1-10, 21-30, and 41-54 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

4. Independent claims 1, 41, and 48 have no tangible result. The claims result in steps that map memory elements to a shared physical memory element. However, there is no tangible result that is accomplished as a result of the method (i.e. transmitting the data).

5. Claim 21 recites a "virtual machine manager"; however, it appears that the system would reasonably be interpreted by one of ordinary skill in the art as software, per se, failing to be tangibly embodied or include any recited hardware as part of the system.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

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The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 4, 7-8, 17, 21, 30, 37, and 43-46 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

a. The following terms lack antecedent basis in the claims:

- i. Claims 4 and 14, line 1, "the transmitting buffer" and line 3, "the receiving buffer".
- ii. Claims 7, 27, and 47, line 4, "the destination".
- iii. Claim 8 line 8, "the first machine".
- iv. Claim 17 line 5, "the destination".
- v. Claim 37 line 3, "the destination".
- vi. Claim 43 line 3, "the tail register".
- vii. Claim 44 line 2, "the receive descriptor", "the second network interface", "the number of packets".
- viii. Claim 45 line 2, "the data".
- ix. Claim 46 line 4, "the first network interface".

b. The following terms are not clearly understood:

- x. Claims 21 line 4, and 31 line 10 recite, "if instructed". It is unclear if the cross-talk detector would instruct the dynamic memory remapper to map, on the basis of the detection in the previous step.

xi. Claim 30 lines 1-2 recite, "wherein the first virtual memory element of the first virtual machine to a second virtual memory element of the second virtual machine are not identical". It is unclear what is meant.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 1-40, and 48-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admitted Prior Art (AAPA).

10. Regarding claim 1, AAPA teaches a method comprising:

mapping a transmitting memory element of the first virtual machine to a shared physical memory element (Fig 1 and pg 3 lines 7-9); and

mapping a receiving memory element of the second virtual machine to the shared physical memory element (Fig 1 and pg 3 lines 7-9).

11. AAPA does not teach detecting that a first virtual machine is attempting to transmit data to a second virtual machine. However, it would have been obvious to perform such a detection since physical resources are shared among all virtual

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machines, and one of ordinary skill in the art would have known that the VMM would map the resources when such resources are required (pg 3 line 4-5).

12. Regarding claim 2, AAPA does not explicitly teach:

detecting that the first virtual machine has placed data in the shared physical memory element; and

informing the second virtual machine that data is available in the shared physical memory element.

13. It would have been well known to one of ordinary skill in the art at the time of the invention to perform the steps of detecting the placement of data and informing the second virtual machine that such data is available. Since resources are shared among the various virtual machines, it would have been well known to one of ordinary skill that continuously polling such resources by the second virtual machine would be highly inefficient. As a result, directly informing the second virtual machine would be a more preferable course of action.

14. Regarding claim 3, AAPA teaches:

detecting if the first virtual machine is attempting to transmit data to a non-virtual machine (pg 3 lines 20-23);

dynamically remapping the transmitting memory element of the first virtual machine to a physical device associated with the transmitting memory element (pg 3 lines 14-16).

15. Regarding claim 4, AAPA teaches wherein the transmitting buffer of the first virtual machine is part of a first virtual device; and the receiving buffer of the second virtual machine is part of a second virtual device (Fig 1 and pg 4 lines 1-2).

16. Regarding claim 5, AAPA teaches that the first virtual device and the second virtual device are devices selected from a group including: an Ethernet device, a network interface, an audio device, a storage device, and a video device (pg 3 line 20).

17. Regarding claim 6, AAPA does not teach that the shared physical memory element is a direct memory access (DMA) buffer.

18. It would have been well known to one of ordinary skill in the art at the time of invention to utilize a direct memory access buffer. The Microsoft Computer Dictionary (Fifth Edition, 2002) teaches that DMA is "frequently used for data transfer directly between memory and an 'intelligent' peripheral device".

19. Regarding claim 7, AAPA teaches that detecting that a first virtual machine is attempting to transmit data to a second virtual machine includes:

monitoring the first virtual machine (pg 3 lines 14-16).

20. AAPA does not explicitly teach comparing the destination of any data transmitted by the first virtual machine to an address associated with the second virtual machine.

21. It would have been obvious to perform this comparison. It is well known that the act of transmitting data requires a destination address. Therefore, the step of detecting an address match would have been well known.

22. Regarding claim 8, AAPA does not explicitly teach that detecting that a first virtual machine is attempting to transmit data to a second virtual machine includes:

reading a mapping configuration data that specifies default virtual device to physical device mappings;

comparing the mapping configuration data for the first virtual machine to the mapping configuration data of the second virtual machine;

assuming that the first virtual machine is attempting to transmit data to the second virtual machine, if a transmitting virtual device of the first machine is mapped to the same physical device as the receiving virtual device of the second virtual machine.

23. It would have been obvious to one of ordinary skill in the art to read and compare mapping data. In order to transmit data, it would have been well known to determine whether both virtual machines were connected to the same device. Therefore, one would be motivated by the desire to determine whether the two virtual machines were mapped to the same device.

24. Regarding claim 9, AAPA teaches that mapping a transmitting memory element of the first virtual machine to a shared physical memory element includes: determining if the transmitting memory element is currently mapped to a transmitting memory element

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of a physical device; if so, unmapping of the transmitting memory element from the transmitting memory element of the physical device; and remapping the transmitting memory element of the first virtual machine to the shared physical memory element (pg 3 lines 10-19, wherein it is inherent that the VMM would remap the virtual devices depending on resource requirements).

25. Regarding claim 10, AAPA teaches detecting that the second virtual machine is attempting to transmit data to the first virtual machine; mapping a transmitting memory element of the second virtual machine to the shared physical memory element; and mapping a receiving memory element of the first virtual machine to the shared physical memory element (pg 3 lines 17-19, wherein it is inherent that the virtual machines could be switched to perform bi-directional communication).

26. Regarding claims 11-20, they are the article claims of claims 1-10 above. Therefore, they are rejected for the same reasons as claims 1-10 above.

27. Regarding claim 21, AAPA teaches a virtual machine manager (pg 3 lines 1-3). However, AAPA does not explicitly teach a cross-talk detector to detect if a first virtual machine is attempting to transmit data to a second virtual machine and a dynamic memory remapper to, if instructed by the cross-talk detector, map a first virtual memory of the first virtual machine to a second virtual memory of the second virtual machine via a shared physical memory element.

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28. AAPA implies that the VMM can be utilized as a cross-talk detector (pg 4 lines 3-5 and pg 3 lines 4-6). It would have been obvious to one of ordinary skill in the art to utilize a memory remapper to implement the loopback solution taught by AAPA (pg 4 lines 6-8). AAPA also teaches that the VM assures that the virtual machines are mapped correctly (pg 3 lines 14-19).

29. Regarding claim 22, AAPA teaches that the dynamic memory remapper is capable of: mapping a transmitting memory element of the first virtual machine to a shared physical memory element; and mapping a receiving memory element of the second virtual machine to the shared physical memory element (pg 3 lines 7-12).

30. Regarding claim 23, AAPA does not teach that the cross-talk detector is further capable of: detecting that the first virtual machine has placed data in the shared physical memory element; and informing the second virtual machine that data is available in the shared physical memory element.

31. It would have been well known to one of ordinary skill in the art at the time of the invention to perform the steps of detecting the placement of data and informing the second virtual machine that such data is available. Since resources are shared among the various virtual machines, it would have been well known to one of ordinary skill that continuously polling such resources by the second virtual machine would be highly inefficient. As a result, directly informing the second virtual machine would be a more preferable course of action.

32. Regarding claim 24, AAPA teaches that the cross-talk detector is further capable of detecting if the first virtual machine is attempting to transmit data to a non-virtual machine (pg 3 lines 20-23); and the dynamic memory remapper is further capable of dynamically remapping the transmitting memory element of the first virtual machine to a physical device associated with the transmitting memory element (pg 3 lines 14-16).

33. Regarding claim 25, AAPA teaches that the cross-talk detector is further capable of monitoring the first and second memories wherein the memories are part of virtual devices selected from a group including: an Ethernet device, a network interface, an audio device, a storage device, and a video device (pg 3 line 20).

34. Regarding claim 26, AAPA does not teach that the shared physical memory element is a direct memory access (DMA) buffer.

35. It would have been well known to one of ordinary skill in the art at the time of invention to utilize a direct memory access buffer. The Microsoft Computer Dictionary (Fifth Edition, 2002) teaches that DMA is "frequently used for data transfer directly between memory and an 'intelligent' peripheral device".

36. Regarding claim 27, AAPA teaches that the cross-talk detector is capable of: monitoring the first virtual machine (pg 3 lines 14-16).

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37. AAPA does not explicitly teach comparing the destination of any data transmitted by the first virtual machine to an address associated with the second virtual machine. It would have been obvious to perform this comparison. It is well known that the act of transmitting data requires a destination address. Therefore, the step of detecting an address match would have been well known.

38. Regarding claim 28, AAPA teaches that the dynamic memory remapper is capable of: determining if the transmitting memory element is currently mapped to a transmitting memory element of a physical device; if so, unmapping of the transmitting memory element from the transmitting memory element of the physical device; and remapping the transmitting memory element of the first virtual machine to the shared physical memory element (pg 3 lines 10-19, wherein it is inherent that the VMM would remap the virtual devices depending on resource requirements).

39. Regarding claim 29, AAPA teaches that the cross-talk detector is capable of detecting that the second virtual machine is attempting to transmit data to the first virtual machine; and wherein the dynamic memory remapper is capable of mapping a transmitting memory element of the second virtual machine to the shared physical memory element; and mapping a receiving memory element of the first virtual machine to the shared physical memory element (pg 3 lines 17-19, wherein it is inherent that the virtual machines could be switched to perform bi-directional communication).

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40. Regarding claim 30, AAPA teaches that the first virtual memory element of the first virtual machine to a second virtual memory element of the second virtual machine are not identical but share substantially similar characteristics (Fig 1).

41. Regarding claims 31-40, they are the system claims of claims 21-30 above. Therefore, they are rejected for the same reasons as claims 21-30 above.

42. Regarding claim 48, AAPA teaches a method comprising:

statically mapping a transmitting memory element of the first virtual machine to a shared physical memory element (Fig 1 and pg 3 lines 7-9); and

statically mapping a receiving memory element of the second virtual machine to the shared physical memory element (Fig 1 and pg 3 lines 7-9).

43. AAPA does not teach detecting that a first virtual machine is configured to transmit data to a second virtual machine. However, AAPA does teach that virtual machine monitors are responsible for mapping virtual devices to physical devices and such a mapping process is the same for all devices (pg 3 lines 4-6). It would have been obvious to one of ordinary skill in the art at the time of the invention that detecting a configuration would be a necessary step in order to determine how the mapping of physical devices is to be performed.

44. Regarding claim 49, AAPA does not teach:

statically mapping a receiving memory element of the first virtual machine to a second shared physical memory element; and statically mapping a transmitting memory element of the second virtual machine to the second shared physical memory element.

45. It would have been obvious to one of ordinary skill in the art at the time of the invention to map the virtual machines to a second shared physical memory element. One would be motivated by the desire to enable bidirectional communication as taught by AAPA (pg 3 line 19) while maintaining data integrity of the two memory elements.

46. Regarding claim 50, AAPA does not teach detecting that a first virtual machine is configured to transmit data to a second virtual machine is done when the first virtual machine is started.

47. It would have been obvious to one of ordinary skill in the art at the time of the invention to perform the detection upon initialization. One would be motivated by the desire to increase the efficiency of the system by performing the mapping of resources upon start up.

48. Regarding claims 51 and 52, AAPA does not teach that detecting that a first virtual machine is configured to transmit data to a second virtual machine includes reading a configuration file that explicitly or implicitly denotes that the first and second virtual machines are virtually coupled.

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49. It would have been obvious to one of ordinary skill in the art at the time of the invention to read configuration data that denotes whether the virtual machines are virtually coupled. Configuration information is well known in the art to define arrangement of systems. One would be motivated by the desire to define ahead of time the arrangement of virtual machines in such a system.

50. Regarding claim 53, AAPA does not teach that the shared physical memory element comprises a direct access memory buffer.

51. It would have been well known to one of ordinary skill in the art at the time of invention to utilize a direct memory access buffer. The Microsoft Computer Dictionary (Fifth Edition, 2002) teaches that DMA is "frequently used for data transfer directly between memory and an 'intelligent' peripheral device".

52. Regarding claim 54, AAPA teaches that the virtual memory elements of the first and second virtual machines are part of virtual devices selected from a group of virtual devices comprising: an Ethernet device; a network device; an audio device; a storage device; and a video device (pg 3 line 20).

53. Regarding claims 55-61, they are the article claims of claims 48-54 above. Therefore, they are rejected for the same reasons as claims 48-54 above.

54. Claims 41-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Macchiano et al. (US Pat No. 7,111,303 hereinafter Macchiano).

55. Regarding claim 41, Macchiano teaches a method of communicating between two virtual machines utilizing a virtual machine manger comprising:

detecting that a first virtual machine, having a first virtual network interface, is attempting to transmit data to a second virtual machine, second virtual network interface, via the virtual network interfaces (col 3 lines 31-35, therein the invention is able to detect that data should be transmitted);

mapping a transmitting memory element of the first virtual network interface to a virtual LAN (col 5 lines 4-6 and 54-58); and

mapping a receiving memory element of the second virtual network interface to the virtual LAN (col 5 lines 4-6 and 54-58).

56. Macchiano does not explicitly teach mapping to a direct memory access buffer. Macchiano's invention is directed towards creating a virtual LAN to facilitate communications between two virtual machines without using a physical network layer. Therefore, the virtual LAN is equivalent to a direct memory access buffer in that it acts as a medium to allow the sending and retrieval of transmitted data.

57. Regarding claim 42, Macchiano teaches:

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detecting that the first virtual machine has placed data in the direct memory access buffer (col 9 lines 8-11); and

informing the second virtual machine that data is available in the direct memory access buffer (Fig 6, step 216 and col 9 lines 27-29).

58. Regarding claim 43, Macchiano does not explicitly teach that the first virtual machine:

placing at least one packet into the direct memory access buffer; and

moving the tail register of the first virtual network interface to indicate how many packets where written to the direct memory access buffer.

59. Macchiano teaches using a virtual LAN along with IP protocols that enables such communication (col 9 lines 2-7). It is well known that an IP header contains the total length attribute to indicate the message size. Therefore, it would have been obvious to one of ordinary skill in the art to place at least one packet into the direct memory access buffer and to move the tail register of the first virtual network interface to indicate how many packets where written to the direct memory access buffer.

60. Regarding claim 44, Macchiano teaches further comprising the virtual machine manager:

sending a receive interrupt to the second virtual machine (col 9 line 28).

61. Macchiano does not explicitly teach moving the receive descriptor head register of the second network interface by the number of packets written to the direct memory

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access buffer and updating the status of the second network interface to indicate that a packet has been received.

62. It would have been obvious to one of ordinary skill in the art at the time of the invention to move the receive descriptor head register of the second network interface by the number of packets written to the direct memory access buffer and updating the status of the second network interface to indicate that a packet has been received. It is well known in the art to allocate an appropriately sized buffer to receiving data.

Furthermore, it is well known to send an acknowledge signal when receiving a packet.

63. Regarding claim 45, Macchiano teaches further comprising the second virtual machine: reading the data from the direct memory access buffer (col 9 lines 41-43).

64. Regarding claim 46, Macchiano does not explicitly teach further comprising, the virtual machine manager:

detecting that the second virtual machine has read the data from the direct memory buffer;

updating the status of the first network interface to indicate that the data has been received; and

injecting a transmit complete interrupt to the first virtual machine.

65. It would have been obvious to one of ordinary skill in the art at the time of the invention to detect the data read, update the status, and inject a transmit complete

interrupt. It is well known in that network communications frequently utilize an acknowledge signal to indicate to the sender that transmission is successful.

66. Regarding claim 47, Macchiano teaches that detecting that a first virtual machine is attempting to transmit data to a second virtual machine includes: monitoring the first virtual machine; comparing the destination of any data transmitted by the first virtual machine to an address associated with the second virtual machine (col 9 lines 12-20).


Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric C. Wai whose telephone number is 571-270-1012. The examiner can normally be reached on Mon-Thurs, 9am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Meng - Ai An can be reached on 571-272-3756. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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